

Nuclear, Biological, and Chemical Weapons and Missiles: Status and Trends

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Summary

The United States has long recognized the dangers inherent in the spread of nuclear, biological, and chemical (NBC) weapons, and missiles. This report, which analyzes NBC weapons programs potential threat patterns around the globe, is updated as needed.

The total number of nuclear, biological, and chemical weapons in the world is shrinking as the major powers scale back their inventories through unilateral reductions and arms control, but other countries and groups still try to acquire these weapons. There are five established nuclear weapon states (China, France, Russia, the United Kingdom, and the United States). India and Pakistan declared their nuclear weapons capability with nuclear tests in 1998, as did North Korea in 2006. Israel is also widely believed to have a nuclear weapon arsenal.

About a dozen countries have offensive biological weapons (BW) programs, and the same number have chemical weapons (CW) programs. That number could grow, as new technologies are developed and the international flow of information, goods, expertise, and technology continues. While the United States and Russia eliminated intermediate-range missiles and are reducing their intercontinental missile inventories, China is modernizing and expanding its missile force. North Korea, Iran, Israel, India, and Pakistan are building short- and medium-range missiles and are developing longer-range missiles. Dozens of countries have or are developing short-range ballistic missiles and more are likely to buy them. Over 80 countries have cruise missiles; about 40 manufacture or have the ability to manufacture them. And terrorists continue their efforts to acquire NBC capabilities.

Elements in North Korea, Russia, China, India, Pakistan, and other countries continue to export weapons technology. The potential for secondary proliferation markets has grown, and concern about the ability of individual actors like the Pakistani nuclear scientist, A.Q. Khan, to peddle nuclear technology has grown considerably.

The number of countries or groups that will acquire or produce NBC weapons may decrease if diplomacy, arms control treaties, nonproliferation regimes, and security and assistance strategies are effective. NBC weapons and missiles will remain a potential threat for the foreseeable future, but most observers readily agree that, even if nonproliferation policies alone are insufficient to halt NBC programs, such measures can slow those programs until states are persuaded that NBC weapons are not in their national security interest.

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Background

In the mid-1990s, the primary threat posed by NBC weapons to the United States shifted from an all-out U.S.-Russian strategic exchange to less overwhelming, but more numerous and perhaps less predictable threats.¹ The dissolution of the Soviet Union had turned some Russian weapons of mass destruction (WMD) strengths into weaknesses and the fear of “loose nukes” prompted the U.S. government to help shore up the safety and security of Russian WMD infrastructure. Around the same time, U.N. inspections uncovered Iraq’s massive NBC weapons programs and a crisis erupted over the North Korean nuclear weapons program. It could no longer be assumed that the United States would face symmetric or parallel threats. A “paradox of the new strategic environment,” according to then-Secretary of Defense William Cohen, was that “American [conventional] military superiority actually *increases* the threat of nuclear, biological and chemical attack against us by creating incentives for adversaries to challenge us asymmetrically.”² Accordingly, Congress has been concerned about the countries and groups that have nuclear, biological and chemical (NBC) weapons, are developing or trying to acquire them, and about those who have or seek missile delivery systems.

The heightened sense of vulnerability to terrorism since the attacks in September 2001, coupled with reports of al Qaeda pursuing research on chemical, biological, radiological, and nuclear weapons, has focused attention on the connection between terrorism and WMD. In March 2002, President Bush stated that “... every nation in our coalition must take seriously the growing threat of terror on a catastrophic scale—terror armed with biological, chemical, or nuclear weapons.” The unpredictability of terrorist efforts to acquire NBC weapons and a potentially higher probability of use pose a serious challenge to global stability and security. In particular, the Bush Administration has singled out state sponsors of terrorism with NBC weapons programs as particular security threats. U.S. and allied leaders and analysts continue to debate the exact nature and extent of the WMD threat.

The status of nuclear, chemical, and biological weapons worldwide has changed only slowly over time. In absolute numbers, stockpiles are actually decreasing. Some U.S. and foreign analysts emphasize the positive impact of the demise of the Soviet Union and progress made in U.S.-Russian arms control and international arms control. Others emphasize the negative impact of the nuclear tests by India, Pakistan and North Korea; missile tests by North Korea, Iran, India, and Pakistan; continuing transfers of dangerous technology by states such as China, Russia, and North Korea; the activities of clandestine procurement networks; and a growing interest in NBC weapons among terrorists. This report focuses on the current threat and trends in nuclear, biological, and chemical weapons and missiles.

Implications for U.S. Policy Decisions

Potential NBC weapons threats to U.S. security interests affect important national security and foreign policy decisions, including:

- the size and nature of the U.S. military force structure

¹ Nuclear and biological weapons can cause massive casualties and other damage. The effects of chemical weapons are generally confined to smaller geographic areas and cause fewer casualties but can create panic in a poorly protected population. Although radiological weapons are sometimes considered in the WMD category, they are covered separately.

² Office of the Secretary of Defense, Report to Congress, *Proliferation: Threat and Response*, November 25, 1997 (hereafter *PTR 1997*).

- U.S. weapons and equipment acquisition
- U.S. doctrine and strategy for homeland defense and military operations abroad, including U.S. training for NBC environments
- foreign policy and economic policy toward countries of proliferation concern and their neighbors.

In addition, the status and trends of these weapons are key factors in national and international debates regarding:

- the character of the threat to U.S. security posed by nuclear, chemical and biological weapons delivered by terrorists, missiles, aircraft, or ships
- whether states or groups are acquiring NBC weapons and missiles to deter or to attack regional powers or the United States
- whether intelligence estimates should be based on the capability and/or intent of countries and terrorist groups to use NBC weapons and missiles
- whether U.S. intelligence collection and analysis resources are adequate
- whether the United States should emphasize a strategy of deterrence, preemption, or national defense
- the appropriate mix of defense (active and passive), export control, assistance, and arms control
- the appropriate mix of unilateral, bilateral, and multilateral approaches.

In the last decade, the U.S. government has taken many steps to address NBC weapons proliferation.³ For example, in December 2002, the White House released the “National Strategy to Combat Weapons of Mass Destruction,” which divided relevant policy into three pillars: counterproliferation to combat WMD use; strengthened nonproliferation to combat WMD proliferation; and consequence management to respond to WMD use.” Counterproliferation efforts include interdicting WMD materials, expertise and technology to hostile states and terrorist organizations, as well as deterrence, defense and mitigation. According to the 2002 strategy, these efforts also include preemptive actions to “detect and destroy an adversary’s WMD assets before these weapons are used.”⁴ Strengthened nonproliferation includes active diplomacy, multilateral regimes, threat reduction assistance, nuclear material and export controls, and nonproliferation sanctions. Finally, consequence management entails homeland defense against WMD threats.

Proliferation and Risk of Use

Several factors appear to facilitate the spread of dangerous technology to additional countries and groups. These same factors also might increase the likelihood that NBC weapons will be used (either militarily or for blackmail):

- Technological developments (in NBC, computer, and production technology).
- Increasingly free flow of information, people and goods.
- Growing disparities in conventional military capabilities.

³ See CRS Report RL31559, *Proliferation Control Regimes: Background and Status*, coordinated by Mary Beth Nikitin.

⁴ “National Strategy to Combat Weapons of Mass Destruction,” December 11, 2002. See <http://www.whitehouse.gov/news/releases/2002/12/WMDStrategy.pdf>.

- Growing disparities in strategic defenses.
- Continued prestige of nuclear power.
- Growing prestige of missile capabilities.
- Perceived utility of NBC threats to deter U.S. intervention.
- Perceived disdain by major powers for certain arms control agreements and international cooperation on nonproliferation.

Threat assessments are highly debated exercises and necessarily subjective because they must assess not only technical capabilities (quantity and quality of weapons and control thereof) but also the intentions of the state or group that possesses the weapons (including options and thresholds for use). The connection between the existence of the technology or weapon and risk of use is not always clear. One school of thought is that the risk of use is directly proportional to the size of stockpiles or diffusion of technology or material. An opposing view is that the weapons themselves are manageable on a case-by-case basis.⁵

In general terms, the reduction of global and regional tension helps reduce the perceived need for weapons of mass destruction. Economic and political integration are also thought to reduce incentives for proliferation. The strong and credible U.S. deterrent capability might weaken the likelihood that some hostile countries will acquire or use WMD. Analysts debate whether U.S. development of a National Missile Defense system would deter the proliferation and use of WMD or would incite further proliferation.

The NBC threat emanating from terrorist groups is even more complicated to assess. It is frequently argued that terrorist groups will find it easier to cross thresholds of NBC use than even some rogue states and that they will not adhere to traditional notions of deterrence. President Bush stated in a March 11, 2002, speech, “Some states that sponsor terror are seeking or already possess weapons of mass destruction; terrorist groups are hungry for these weapons, and would use them without a hint of conscience. And we know that these weapons, in the hands of terrorists, would unleash blackmail and genocide and chaos.”⁶

The strong connection between the further spread of NBC capabilities to states and potential availability of technology to terrorists is not new. In the *National Security Strategy for a New Century* (2000), the Clinton Administration noted that the “proliferation of advanced weapons and technologies threatens to provide rogue states, terrorists and international crime organizations with the means to inflict terrible damage on the United States, our allies, and U.S. citizens and troops abroad.” Two years later, the U.S. Special Representative for Nuclear Nonproliferation remarked to the NPT Preparatory Committee that

“The spread of nuclear weapons to additional states not only increases the risk of nuclear war among nations, but also increases the risk of nuclear terrorism. The nuclear weapon program of a proliferating state, from the design of a weapon to its assembly, offers new opportunities for exploitation by terrorists. New stockpiles of weapons-grade nuclear material present a tempting target. Nations seeking nuclear weapons who also harbor terrorists represent a particularly severe threat to the civilized world.”⁷

⁵ These debates rarely occur about other military equipment because the norms against use are not so clearly defined. See CRS Report RL30427, *Missile Survey: Ballistic and Cruise Missiles of Selected Foreign Countries*, by Andrew Feickert.

⁶ See <http://www.whitehouse.gov/news/releases/2002/03/20020311-1.html>.

⁷ Former Ambassador Norman A. Wulf’s statement to the preparatory committee of the NPT Review Conference, New York, April 8, 2002.

On the other hand, analysts debate whether rogue states themselves plan to use WMD against the United States. Some analysts doubt these countries would overtly attack the United States with WMD because of the U.S. ability to conduct an overwhelming counterattack. But others contend NBC weapons might nevertheless be seen by these countries as useful to limit U.S. military options and as a weapon of last resort, particularly where regime survival is at stake.

The United States government works hard to decrease the risk of WMD use, the spread of such weapons and capabilities, and the U.S. vulnerability to the weapons. U.S. leadership has been critical for the NPT, the International Atomic Energy Agency (IAEA), the Nuclear Suppliers Group, Zangger Committee, a fissile material production moratorium, the Chemical Weapons Convention, Australia Group, Missile Technology Control Regime, Wassenaar Arrangement, START I, II, and III, and bilateral efforts with numerous countries to discourage the spread of weapons technology and the acquisition, deployment, or use of WMD.⁸ But various constituencies have criticized some recent U.S. actions for what they see as stimulating, as well as weakening the norms against, WMD proliferation: policies such as the development of a national missile defense; potential development of new nuclear weapons; withdrawing from the Anti-Ballistic Missile Treaty; discussions of regional missile defense systems in Asia and the Middle East; and refusal to consent to ratification of the Comprehensive Test Ban Treaty. Some critics are concerned that broader nonproliferation objectives will fall prey to shorter term goals in the war on terrorism.⁹ Abroad, observers have expressed concern that the United States is abandoning its arms control and nonproliferation leadership and that the U.S. emphasis on freedom of action will translate into other states seeking the same (e.g., Russia), to the detriment of the international nonproliferation regime.¹⁰

Missile defense advocates argue that missile defense strengthens deterrence and “keeps rogue states from being able to blackmail the United States, its friends or allies by threatening a missile attack.” Additionally, they note that missile defense weakens the incentive to develop, test, produce and deploy missiles by states like Iran and North Korea.¹¹

NBC Weapons and Missiles: Where Are They?

About twenty-five countries, according to various U.S. government sources, are suspected of having nuclear, biological, or chemical (NBC) weapons programs or stockpiles. **Table 1** lists those countries that have, or may have had NBC weapon programs and missile capabilities within the last several years. **Table 1** distinguishes between stages of development—from a research and development (R&D) program, to acquiring components for weapons, to an actual stockpile. Most of these capabilities have been developed covertly.

U.S. intelligence on foreign WMD programs can vary dramatically not just among countries, but also among such programs for a single country. In general, nuclear and ballistic missile programs are more easily detectable than biological and chemical weapons programs because the former

⁸ For explanations of these agreements, see CRS Report RL33865, *Arms Control and Nonproliferation: A Catalog of Treaties and Agreements*, by Amy F. Woolf, Mary Beth Nikitin, and Paul K. Kerr.

⁹ See Leonard Weiss, “The Nexus of Counterterrorism and Nonproliferation Policy,” *Monitor*, Winter 2002, Vol. 8, No. 1, pp. 3-7.

¹⁰ Remarks by Therese Delpech, Director, Strategic Affairs, French Atomic Energy Commission, at Wilson Center forum, April 16, 2002. See also Jayantha Dhanapala, “Arms Control and Multilateralism: The Problem of Political Will,” presentation to Tenth Annual International Arms Control Conference—Conundrums in Arms Control: The New Millennium,” Albuquerque, New Mexico, April 14-16, 2000, is available online at <http://disarmament.un.org:8080/speech/statements.htm>.

¹¹ Fact Sheet: U.S. State Department on U.S. Nonproliferation Efforts, September 7, 2001. <http://usinfo.state.gov>

often have specific characteristics (e.g., flight tests, reactor operations) which are more easily observed. **Table 1** does not attempt to portray a country's intent—how serious its pursuit of NBC weapons capability is, or what its ultimate objectives might be. These variables would have a significant impact on threat assessments of WMD capability.

In numerical terms, NBC weapons, missiles and programs have not grown much in the last decade, as proliferation by a few countries has been offset by reductions in weapons by others. However, some countries are actively building NBC weapon stockpiles and they are improving capabilities to deliver these weapons, taking advantage of increasingly available missile technology. These states are seeking or have developed indigenous production capabilities, and some have themselves become suppliers of NBC weapon or missile technologies. Some of these new suppliers either support terrorism or have terrorist activities on their soil. The potential for additional countries, or possibly terrorist groups, to produce NBC weapons using available technology, has become a greater concern in recent years.

Nuclear Weapon Arsenals and Programs

Five states are considered nuclear weapon states under the Nuclear Non-Proliferation Treaty (NPT): China, France, Russia, the United Kingdom, and the United States. Four of these countries have declared that they have stopped producing fissile material; China is believed to have stopped.¹² Four other states—India, Israel, Pakistan, and North Korea—have nuclear weapons. The first three have not signed the NPT. North Korea announced its withdrawal from the NPT January 10, 2003. Whether the government remains an NPT state-party is unclear.

Nuclear Weapons-States

China does not publicly disclose its nuclear arsenal. However, a 2004 Chinese foreign ministry fact sheet stated that Beijing “has performed the least number of nuclear tests and possesses the smallest nuclear arsenal.”¹³ Defense Intelligence Agency Director Lieutenant General Michael Maples told the Senate Armed Services Committee in February 2006 that “China currently has more than 100 nuclear warheads.”¹⁴

Beijing has between 90-112 nuclear warheads deployed on its land-based ballistic missiles:

- 20 CSS-4 Intercontinental Ballistic Missiles (ICBM) (liquid-fueled, range 12,900 + km). These are the only missiles that can reach the continental United States;
- 16-24 CSS-3 ICBMs (liquid-fueled, range 5,470 + km);
- 14-18 CSS-2 IRBMs (Intermediate-Range Ballistic Missiles (IRBM) (liquid-fueled, range 2,790 + km);

¹² Office of the Secretary of Defense, Report to Congress, *Proliferation: Threat and Response*, 2001 (hereafter *PTR 2001*), p.14

¹³ <http://www.fmprc.gov.cn/eng/wjb/zzjg/jks/cjjk/2622/t93539.htm>. Notably, the United Kingdom made the same claim in its December 2006 Defence White Paper, *The Future of the United Kingdom's Nuclear Deterrent* (hereafter *UK White Paper*). The paper and accompanying factsheets may be found at <http://www.fas.org/nuke/guide/uk/doctrine/sdr06/index.html>. The United Kingdom then possessed about 200 operationally available nuclear warheads, according to that paper.

¹⁴ “Current and Projected National Security Threats to the United States,” Statement for the Record Senate Armed Services Committee, February 28, 2006.

- 40-50 CSS-5 MRBM (Medium-Range Ballistic Missiles) (mobile, solid-fueled, range 1,770 + km).¹⁵

(For an explanation of the different classes of missiles, see **Table 1**.)

According to the 2007 Department of Defense “Annual Report to Congress on the Military Power of the People’s Republic of China,” Beijing’s solid-fueled, road-mobile DF-31 ICBM “achieved initial threat availability in 2006, and will likely achieve operational status in the near future, if it has not already done so.”¹⁶ That missile has an estimated range of 7,250 km. None of China’s nuclear-armed missiles carry multiple reentry vehicles.

China also has one XIA-class ballistic-missile submarine with 12 launch tubes capable of holding 1,700 km range JL-1 (Submarine-Launched Ballistic Missiles) SLBM.¹⁷ The precise status of that submarine is unclear. According to the National Air and Space Intelligence Center (NASIC), it is not deployed.¹⁸ Responding to a question from *Seapower* magazine on whether the submarine is operational, the Office of Naval Intelligence (ONI) stated in December 2006 that the XIA “likely constitutes a limited component of China’s current nuclear deterrent force.” ONI’s statement added that “the range of the JL-1 limits the XIA’s utility as a deterrent platform,” but the missile could still hit “targets throughout the region ... from launch points inside traditional Chinese Navy operating areas.”¹⁹

According to a National Resources Defense Council (NRDC) estimate, Beijing may have about 40 nuclear bombs for delivery by aircraft.²⁰ But those weapons may not be deployed. A 1993 National Security Council report to Congress states that the “Chinese Air Force has no units whose primary mission is to deliver China’s small stockpile of nuclear bombs. Rather, some units may be tasked for nuclear delivery as a contingency mission.”²¹

The NRDC also estimates that Beijing may have about 70 nuclear warheads in storage.²²

France has approximately 350 nuclear warheads deployed on submarine-launched ballistic missiles (SLBMs) and air-launched cruise missiles (ALCMs).²³ None of these weapons are currently aimed at any designated targets. Paris has four ballistic missile submarines, each of

¹⁵ U.S. Department of Defense. *Annual Report to Congress on the Military Power of the People’s Republic of China*, 2007 (Hereafter, *CMP 2007*). The data from the 2005 version of the report shows that China had a total of 73-85 warheads on its ballistic missiles; the 2006 report data gives a total of 73-112. Each of the three reports contains different estimates for the numbers of CSS-5 missiles.

¹⁶ A Department of Defense official explained during a May 2007 press briefing that when we say initial threat availability, what we mean is that the system is available and could be used if China’s leaders determine that they wanted to. The distinction between initial threat availability and initial operational capability is that right now we assess that DF-31 may not be fully integrated into the force structure, may not have all the requisite supporting personnel/equipment that we believe they would need to have to be considered fully operational. (DoD Background Briefing with Defense Department Officials, May 25, 2007.)

¹⁷ *CMP 2007*; National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, March 2006 (Hereafter, *BCMT 2006*).

¹⁸ *BCMT*, 2006.

¹⁹ ONI’s responses can be found at <http://www.fas.org/nuke/guide/china/ONI2006.pdf>.

²⁰ *Chinese Nuclear Forces, 2006*, Natural Resources Defense Council Nuclear Notebook (Hereafter, *Chinese Nuclear Forces, 2006*).

²¹ National Security Council, *Report to Congress on Status of China, India and Pakistan Nuclear and Ballistic Missile Programs*, 1993. <http://www.fas.org/irp/threat/930728-wmd.htm>.

²² *Chinese Nuclear Forces, 2006*.

²³ *UK White Paper*; SIPRI Yearbook 2007; *French Nuclear Forces, 2005* Natural Resources Defense Council Nuclear Notebook.

which can carry 16 4,000 km-range M45 SLBMs. Each missile can hold up to six warheads. France is developing the 6,000 km-range M51 SLBM to replace the M45. Paris has also been developing a new class of ballistic submarines; the last of the four is to come into service in 2010.

France's other nuclear warheads are carried on the 300 km range Air-Sol-Moyenne Portée (ASMP) cruise missiles carried by Mirage 2000N and Super Étendard aircraft. 50 are assigned to the former; 10 to the latter. France is also developing a new ALCM (the 400-500 km range ASMP-A) for deployment on some Mirage and Rafale aircraft.

In July 2007, Russian strategic nuclear forces included 104 10-warhead SS-18 ICBMs, 136 6-warhead SS-19 ICBMs, 222 single-warhead SS-25 road-mobile missiles, 44 single-warhead, silo-based SS-27 ICBMs, and 3 single-warhead, mobile SS-27 ICBMs. Moscow also has 14 ballistic missile submarines, equipped with a total of 288 SLBMs. Russia's bomber fleet consists of 78 aircraft—15 Blackjack bombers and 63 Bear H bombers. Under the rules of the Strategic Arms Reduction Treaty (START), each of these counts as 8 warheads, but they can be equipped to carry up to 16 cruise missiles.²⁴ Russia is also estimated to have approximately 2,000-3,000 operational tactical warheads and approximately 8,000-10,000 stockpiled strategic and tactical warheads.²⁵

Moscow's strategic forces are designed to deter nuclear and conventional aggression, but Russia "is prepared to conduct limited nuclear strikes" to repel an enemy or change the course of battle. An unauthorized or accidental nuclear launch of a Russian strategic missile is deemed highly unlikely.²⁶

The United Kingdom has fewer than 160 operationally available nuclear warheads. These are deployed on four Vanguard-class submarines, each of which carries up to 48 warheads on a maximum of 16 Trident D5 SLBMs. That missile has a range of about 7,400 km. According to a December 2006 White Paper, the United Kingdom normally has only one submarine "on deterrent patrol at any one time," which is "normally at several days 'notice to fire.'" The missiles are "not targeted at any country," the paper adds.²⁷ The White Paper states that the United Kingdom intends to reduce its reserve stockpile by 20%. The size of that stockpile is secret, but the paper describes it as a "small margin to sustain the operationally available warheads."

The United Kingdom projects that its currently-deployed submarines will begin leaving service in the early 2020s. In March 2007, Parliament approved the government's plan, announced in December 2006, to develop a new class of replacement submarines.²⁸ According to the White Paper, London could decide to deploy only three submarines, but that decision "will be taken when we know more about their detailed design." The government has also decided to participate in the U.S. Life Extension Program for the Trident missile, which will enable London to retain the missile in service until the early 2040s.

²⁴ See CRS Report RL31448, *Nuclear Arms Control: The Strategic Offensive Reductions Treaty*, by Amy F. Woolf.

²⁵ Arms Control Association Fact Sheet.

²⁶ Ibid.

²⁷ *UK White Paper*; Secretary of State Rt Hon Des Browne confirmed in a November 15, 2007 written statement to Parliament that the United Kingdom has "now reduced the number of operationally available warheads from fewer than 200 to fewer than 160." <http://www.publications.parliament.uk/pa/cm200708/cmhansrd/cm071115/text/71115w0007.htm#07111542000024>

²⁸ Wade Boese, "UK Nuclear Submarine Plan Wins Vote," *Arms Control Today*, April 2007.

States Outside the NPT

Israel is said to have produced its first nuclear weapon in the late 1960s and may now have between 75 and 200 weapons.²⁹ India and Pakistan tested nuclear weapons in 1998 and declared their nuclear weapons capability, removing the shroud of nuclear ambiguity on the subcontinent (India tested a “peaceful nuclear device” in May 1974). According to current estimates, Pakistan has approximately 60 nuclear warheads and India has between 36 and 100 nuclear warheads.³⁰

North Korea has produced enough plutonium for at least six nuclear weapons and tested a nuclear weapon with a yield of under 1 kiloton in October 2006. Pyongyang shut down the facilities related to its plutonium-based nuclear weapons program in July 2007.³¹ In 2002, the Central Intelligence Agency (CIA) assessed that North Korea began to develop a uranium enrichment program in 2000. The intelligence community continues to assess that Pyongyang has in the past pursued a uranium enrichment capability and judges with “at least moderate confidence” that the program continues today. North Korea continues to deny the existence of a uranium enrichment program.³²

Suspected Nuclear Weapons Programs

Iran has long been suspected of pursuing a nuclear weapons program. But these concerns increased when an IAEA investigation, which began in 2002, revealed an array of nuclear activities that had not previously been reported to the agency. These included centrifuge and laser enrichment activities and facilities, and the separation of a small quantity of plutonium. As part of an agreement with three nations of the European Union (known as the EU-3, or Germany, France, and the United Kingdom), Iran agreed in October 2003 to sign the Additional Protocol to its nuclear safeguards agreement (which allows for enhanced inspections) and to suspend all uranium enrichment-related activities in return for a promise of technical assistance. Although Iran renewed and expanded its pledge in November 2004 to encompass all enrichment and processing related activities, little negotiating progress was made. In September 2005, the IAEA Board of Governors found Iran to be in noncompliance with its IAEA safeguards agreement. After resuming enrichment-related activities the following January, Iran’s case was referred to the U.N. Security Council in February 2006. Two UN Security Council resolutions (1737 and 1747) have imposed sanctions on Iran. The most recent National Intelligence Estimate (NIE), released in December 2007, states that Iran had a nuclear weapons program in the past, but halted it in fall 2003. The NIE also states that the intelligence community assesses “with moderate confidence Tehran had not restarted its nuclear weapons program as of mid-2007,” but adds that Iran “at a minimum is keeping open the option to develop nuclear weapons.”³³

²⁹ Avner Cohen, *Israel and the Bomb* (New York: Columbia University Press), 1998, p. 1; “Completing the Deterrence Triangle,” Carnegie Endowment for International Peace, Non-Proliferation Project, v. 3, no. 18, June 29, 2000; <http://www.armscontrol.org/factsheets/Nuclearweaponswhohaswhat.asp>; *UK White Paper*. According to a 1974 U.S. National Intelligence Estimate, the intelligence community assessed that Israel “has produced and stockpiled a small number” of nuclear weapons.

³⁰ See CRS Report RL34248, *Pakistan’s Nuclear Weapons: Proliferation and Security Issues*, by Paul K. Kerr and Mary Beth Nikitin; Arms Control Association Fact Sheet, <http://www.armscontrol.org/factsheets/Nuclearweaponswhohaswhat.asp>; SIPRI Yearbook 2007.

³¹ See CRS Report RL34256, *North Korea’s Nuclear Weapons*, by Mary Beth Nikitin.

³² Annual Threat Assessment of the Director of National Intelligence for the Senate Select Committee on Intelligence, February 5, 2008, at http://www.dni.gov/testimonies/20080205_testimony.pdf.

³³ The text of the NIE may be found at http://odni.gov/press_releases/20071203_release.pdf.

U.S. officials sometimes name Syria as a country seeking nuclear weapons. According to an unclassified Office of National Intelligence report, “Pakistani investigators in late January 2004 said they had ‘confirmation’ of an IAEA allegation that [former Pakistani nuclear official] A.Q. Khan offered nuclear technology and hardware to Syria, according to Pakistani press, and we are concerned that expertise or technology could have been transferred. We continue to monitor Syrian nuclear intentions with concern.”³⁴ The IAEA has been investigating whether several countries, including Syria, were involved in a nuclear technology procurement network run by Khan.³⁵ However, two former National Security Council officials have argued that a Syrian nuclear weapons program is unlikely.³⁶

Other governments have relinquished nuclear weapons on their territory (Belarus, Kazakhstan, Ukraine), dismantled their nuclear weapons (South Africa) or have abandoned or forsworn nuclear weapon programs (Argentina, Brazil, Germany, Iraq, Japan, Libya, South Korea, Sweden, Switzerland, and Taiwan).

Nuclear Weapons Trends

Although sensitive nuclear technology exports have been controlled by the Nuclear Suppliers Group (NSG) since the mid-1970s, nuclear technology nonetheless has become increasingly available. The exposure in 2004 of the Khan network has led many observers to propose further controls on nuclear exports. Some of these include a ban on export of reprocessing and enrichment technology by the NSG, a ban on development of reprocessing and enrichment by states that do not already have such capabilities, a legally binding agreement on export controls, and international management of reprocessing and enrichment.

The total number of nuclear warheads in the world will continue to decline over the next few decades as the United States and Russia reduce their stockpiles, even as the number of nations with nuclear weapons may increase. The nuclear inventories of China, India, and Pakistan are small, but all will probably be expanded. There is no indication that Israel will significantly increase or decrease its alleged nuclear arsenal in the near future. North Korea’s production of plutonium at its known nuclear facilities has been halted.

The United States projects that China will expand and continue to modernize its nuclear arsenal. A Department of Defense official explained during a May 2007 press briefing that Beijing is striving to “strengthen its deterrent capability by moving from vulnerable silo-based, liquid-fueled, long-range ballistic missiles to ones that are much more survivable—mobile solid-propellant.”³⁷ The 2007 DOD report projected that by 2010 China’s nuclear forces will “likely” include “enhanced” CSS-3s, CSS-4s, and CSS-5s, DF-31s, and the DF-31A. The latter is a longer-range (11,270 km) variant of the DF-31, and was “expected to reach initial operational capability” in 2007, the report said. NASIC reported in 2006 that Beijing could increase its

³⁴ Office of National Intelligence, *Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 January-31 December 2004*. http://www.odni.gov/reports/2004_unclass_report_to_NIC_DO_16Nov04.pdf.

³⁵ Paul Kerr, “IAEA: Egypt’s Reporting Failures ‘Matter of Concern,’” *Arms Control Today*, March 2005.

³⁶ Flynt Leverett, said in 2005 that “I don’t know that we really have the evidence to indicate” that Syria has a nuclear weapons program. Similarly, former council official Gary Samore said in a September 19, 2007 interview that “the Syrians have never, as far as we know, developed a nuclear weapons program.” See “Inheriting Syria: Bashar’s Trial By Fire,” <http://www.brookings.edu/events/2005/0425middle-east.aspx>; and Bernard Gwertzman, Consulting Editor, <http://www.CFR.org>, “Samore: A Syrian-North Korean Nuclear Relationship?” September 19, 2007. http://www.cfr.org/publication/14250/syrianorth_korea.html?breadcrumb=%2F

³⁷ DoD Background Briefing with Defense Department Officials, May 25, 2007.

number of “ICBM warheads capable of reaching the United States ... to well over 100.” That report also stated that China could develop warheads with multiple reentry vehicles for some of its ICBMs.³⁸ In addition, the DOD report states that “[n]ew air- and ground-launched cruise missiles that could perform nuclear missions will similarly improve the survivability and flexibility of China’s nuclear forces.”

China is also expected to deploy a new SLBM, the JL-2, on a new JIN-class (Type 094) nuclear-powered ballistic missile submarine, which is in development.³⁹ According to ONI, China will “probably build a fleet of five” such submarines, the first of which could reach initial operating capability “as early as 2008.” The JL-2, which has an estimated range of over 8,000 km, is expected to reach initial operational capability between 2007 and 2010.⁴⁰ The submarine appears to have 12 launch tubes, according to open-source satellite imagery.⁴¹

It is worth noting that the intelligence community has typically overestimated the pace at which China has increased its nuclear arsenal.⁴²

Russia will maintain its ability for the foreseeable future to strike the United States with thousands of warheads. However, most analysts agree that Moscow’s strategic nuclear forces will continue to decline during the next 10 years, as it retires aging systems and produces only small numbers of new missiles. Russia might be able to deploy its new SS-27 ICBM with three warheads, instead of one. According to NASIC, Moscow may also be developing another missile, which “could be deployed in both land- and sea-based version,” with an estimated range of over 5,500 km.⁴³ Additionally, Russia has been testing a new SLBM to replace existing inventory.⁴⁴ The Strategic Offensive Reductions Treaty limits Russia and the United States to 1700-2200 strategic warheads, but each side can maintain a stockpile of nuclear weapons and the treaty expires the same day it enters into force-December 31, 2012.

India and Pakistan intensified their nuclear rivalry with tests of nuclear weapons and MRBMs in 1998, and both began to establish doctrine, tactics, and contingency plans for the use of nuclear weapons. The two countries “narrowly averted a full-scale war in Kashmir [in 1999], which could have escalated to the nuclear level.”⁴⁵ While the nuclear competition between India and Pakistan is dangerous, most analysts conclude India’s quest for nuclear weapons is driven primarily by its desire for the status of a major power and by its regional competition with China. In the fall of 2001, however, riots in Pakistan coupled with reports of senior Pakistani nuclear scientist ties to the Taliban and rumored U.S. efforts to gain assurances about the security of Pakistani nuclear weapons all contributed to growing concern about the safety and security of the Pakistani nuclear arsenal.⁴⁶ In May and June of 2002, the increasingly tense military deployments along the Line of

³⁸ *BMCT 2006*.

³⁹ *CMP 2007*.

⁴⁰ *Ibid*.

⁴¹ Hans Kristensen, “A Closer Look at China’s New SSBNs,” October 15, 2007. http://www.fas.org/blog/ssp/2007/10/a_closer_look_at_chinas_new_ss.php

⁴² *Chinese Nuclear Forces, 2006*; Jeffrey G. Lewis, *The Minimum Means of Reprisal: China’s Search for Security in the Nuclear Age* (Cambridge, the MIT Press), 2007, pp. 50-51.

⁴³ *BCMT, 2006*.

⁴⁴ *The Future of the United Kingdom’s Nuclear Deterrent: Defence White Paper*, December 2006; *BMCT 2006*.

⁴⁵ George Tenet, Director of Central Intelligence, “The Worldwide Threat in 2000: Global Realities of Our National Security,” Testimony before the Senate Select Committee on Intelligence, February 2, 2000, pp. 3, 5, and 37.

⁴⁶ See CRS Report RL34248, *Pakistan’s Nuclear Weapons: Proliferation and Security Issues*, by Paul K. Kerr and Mary Beth Nikitin.

Control in Kashmir raised the specter of a conventional crisis spiraling out of control and sparking a nuclear exchange.

As noted above, terrorist organizations are known to have sought fissile material for use in nuclear weapons. A terrorist attack with a nuclear explosive device might be possible, though difficult to achieve.⁴⁷

Another cause for concern is that the barriers to obtaining low-grade nuclear material for “dirty bombs” (radioactive as opposed to fissile material) also have been eroding for the last decade. In the mid-1990s, Chechen rebels and the Aum Shinrikyo cult tried to acquire and use radioactive materials in terrorist devices. Although those amounts were small, analysts agree it is feasible for terrorist groups to use conventional explosives to disperse deadly radioactive material on a wider scale. The number of accounts in the press of individuals trying to buy or sell nuclear material has greatly increased in the last decade; while most are harmless scams, it is quite possible that terrorists could look on and learn what not to buy.

Biological Weapon Arsenals and Programs

No nation publically acknowledges either an offensive biological weapons (BW) program or stockpile. Examination of unclassified sources indicates that several nations are considered, with varying degrees of certainty, to have some BW capability. These are: China, Cuba, Egypt, Iran, Israel,⁴⁸ North Korea, Russia, Syria, and Taiwan.⁴⁹ Iraq had a biological weapons program prior to

⁴⁷ See CRS Report RL32595, *Nuclear Terrorism: A Brief Review of Threats and Responses*, by Jonathan Medalia. For a brief public intelligence account of al-Qa-ida’s nuclear weapons efforts, see *The Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction*, March 31, 2005, pp. 271-72. Peter Zimmerman and Jeffrey Lewis describe a scenario for terrorist construction of a nuclear weapon in “The Bomb in the Backyard,” *Foreign Policy*, November/December 2006.

⁴⁸ See Avner Cohen, “Israel and Chemical/Biological Weapons: History, Deterrence, and Arms Control,” *The Nonproliferation Review*, Fall-Winter 2001, vol. 8, No. 3; Magnus Normark, Anders Lindblad, Anders Norqvist, Björn Sandström, Louise Waldenström, “Israel and WMD: Incentives and Capabilities,” Swedish Defence Research Agency, December 2005. <http://www.foi.se/upload/pdf/israel-and-wmd-1734.pdf>.

⁴⁹ See, *Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments*. Department of State, August 2005. <http://www.state.gov/documents/organization/52113.pdf>; *Chemical and Biological Weapons: Possession and Programs Past and Present*, Center for Nonproliferation Studies, January 2007 <http://cns.miis.edu/research/cbw/possess.htm>; *Chemical and Biological Weapons Proliferation at a Glance*, Arms Control Association, September 2002. <http://www.armscontrol.org/factsheets/cbwprolif.asp>; John C. Rood, Assistant Secretary of State for International Security and Nonproliferation, “Address to the Sixth Biological Weapons Convention Review Conference,” November 20, 2006. *PTN 2001* states that “some twelve countries are now believed to have biological warfare programs.” (p.114).

According to a 1998 Arms Control and Disarmament Agency compliance report,

The United States believes that Taiwan has been upgrading its biotechnology capabilities by purchasing sophisticated biotechnology equipment from the United States, Switzerland, and other countries. The evidence indicating a BW program is not sufficient to determine if Taiwan is engaged in activities prohibited by the BWC.

This concern is not mentioned in either the 2001 or 2005 reports. Similarly, the 1998 report states that “The United States believes that Egypt had developed BW agents by 1972. There is no evidence to indicate that Egypt has eliminated this capability and it remains likely that the Egyptian capability to conduct BW continues to exist.” These concerns are not expressed in either the 2001 or 2005 reports.

the 1991 Persian Gulf War, but ended the program in the 1990s. Libya had in the past been named as a country with a biological weapons program. But after Tripoli announced in 2003 that it would eliminate its WMD programs, no evidence of a biological weapons program was discovered.⁵⁰ There is evidence that Al-Qa'ida had a BW program prior to the 2001 U.S.-led invasion of Afghanistan.⁵¹

Biological Weapons Trends

Because much of the material and equipment used to produce BW has legitimate medical, agricultural, or industrial purposes, and because BW could be produced covertly in a relatively small facility, other countries or groups may have undetected BW programs. Much of the concern over biological weapons has shifted from national programs to the prospect of terrorist acquisition. The concerted, but ultimately unsuccessful, efforts of the Aum Shinrikyo group in Japan to weaponize anthrax in the 1990s demonstrated both the attractiveness of BW to terrorists and the inherent difficulties in weaponization. This leads some experts to maintain that terrorist groups would have difficulty obtaining sufficient materials and know-how to grow, handle, store and disperse biological agents to have a large-scale lethal effect.⁵² With time, however, as biotechnology becomes more widely accessible, some terrorist groups, particularly those with significant state sponsorship, could be able to mount a more successful BW effort. It should be noted that even a small volume of biological agent or toxin, if properly dispersed, could cause significant casualties in an unprotected densely populated area. From a terrorist perspective, even small-scale attacks could provide a very significant political effect, as was demonstrated by the anthrax-laden letters mailed to the U.S. Senate and several news organizations in 2001.⁵³

The covert development of biological weapons, especially in non-member states, remains hard to detect; the use of BW is hard to defend against; and a BW attack could cause potentially enormous casualties or destruction of crops. International trade in BW material, equipment, and technology remains a concern. In the coming decades, as biotechnology makes further advances and international flows of information, people, and goods continue to grow, the threat of biological warfare may also increase. (See “Chemical Weapons Trends” below for a CIA list of trends in chemical and biological weapons proliferation.)

The State Department's 2005 compliance report states that Cuba likely “has the technical capability to pursue some aspects of offensive BW.” However, U.S. officials disagree as to whether Cuba has, or has ever had, a biological weapons program.

⁵⁰ A 2005 report asserted that Tripoli's declarations “have failed to shed light on Tripoli's plans and intentions for its biological program.” See *The Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction*, March 31, 2005, pp. 255-56. A commission spokesperson said in April 2005 that there is a “discrepancy” between the information Libya has provided concerning its biological weapons efforts and previous U.S. intelligence judgments. See Paul Kerr, “Commission Slams WMD Intelligence,” *Arms Control Today*, May 2005.

⁵¹ *The Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction*, pp. 269-70.

⁵² Milton Leitenberg, “An Assessment of the Threat of the Use of Biological Weapons or Biological Agents,” September 18, 2000, paper prepared for the Conference on Biosecurity and Bioterrorism, Istituto Diplomatico Mario Toscano, Rome, Italy, p. 18.

⁵³ See CRS Report RL31669, *Terrorism: Background on Chemical, Biological, and Toxin Weapons and Options for Lessening Their Impact*, and CRS Report RL32391, *Small-scale Terrorist Attacks Using Chemical and Biological Agents: An Assessment Framework and Preliminary Comparisons*, both by Dana A. Shea.

Chemical Weapon Arsenals and Programs

Under the Chemical Weapons Convention (CWC), which went into effect in 1997, member countries are to have destroyed their stockpiles by April 2007. In July 2007, the Organization for the Prohibition of Chemical Weapons (OPCW) confirmed that Albania had become the first country to have destroyed its declared CWs. Five other states—India, Libya, Russia, South Korea, and the United States—have declared possession of such weapons. All have stated that they will destroy their weapons by the Convention’s April 29, 2012, deadline. However, observers have expressed doubts that all will be able to do so, owing to technical and legal challenges. Twelve countries also reported facilities for the production of CW and have pledged to destroy them or convert them to civilian uses. All of the member-states’ declared CW production facilities have been destroyed, according to the OPCW.

The effect of the CWC has probably been to reduce the number of parties with chemical weapons and to reduce the likelihood they will be used. Indeed, the OPCW’s Verification Director Horst Reeps stated in October 2007 that no violations of the CWC have been detected. Nevertheless, it is not clear which countries still have CW programs because the Convention has not been aggressively implemented and there have been no challenge inspections.⁵⁴ Several countries that ratified the CWC have probably terminated their CW programs, but it is suspected that some signatories (such as Iran and China) and several countries that have not ratified the Convention (Egypt, Israel, North Korea, and Syria) may still be developing or producing CW.⁵⁵

Chemical agents can be delivered by aircraft, drones, artillery, rocket launchers, submunitions on cruise or ballistic missiles, dispersion from a chemical reaction or manual or mechanical release. Several countries reportedly have CW warheads for their missiles.

Chemical Weapons Trends

Technology and materials for the production of lethal chemical agents are available internationally, and production facilities can be concealed, so it is possible that additional countries and subnational groups may develop CW capabilities. In 1995, the Japanese religious cult Aum Shinrikyo launched attacks in the Tokyo subway with sarin, a chemical nerve agent. The relatively small number of fatalities (13) indicated the difficulty in effectively disseminating CW agents, however the extent of short-term civil disruption was significant. It is expected that terrorist groups will continue their efforts to obtain a CW capability, and could be assisted in this by state sponsors of terrorism.⁵⁶ The intelligence community has assessed that al-Qaida had a chemical weapons program before the 2001 U.S.-led invasion of Afghanistan. Whether this assessment was accurate is unclear.⁵⁷ Producers of small quantities of CW could multiply, but restrictions established under the CWC are expected to limit large-scale production and stockpiles

⁵⁴ Jonathan B. Tucker, “The Chemical Weapons Convention: Has it Enhanced U.S. Security?” *Arms Control Today*, April 2001, pp. 8-12.

⁵⁵ See CRS Report RL33865, *Arms Control and Nonproliferation: A Catalog of Treaties and Agreements*, by Amy F. Woolf, Mary Beth Nikitin, and Paul K. Kerr, p. 46.

⁵⁶ See also CRS Report RL31669, *Terrorism: Background on Chemical, Biological, and Toxin Weapons and Options for Lessening Their Impact*, and CRS Report RL32391, *Small-scale Terrorist Attacks Using Chemical and Biological Agents: An Assessment Framework and Preliminary Comparisons*, both by Dana A. Shea.

⁵⁷ *The Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction*, pp. 270-71.

among CWC states parties.⁵⁸ The extent to which the worldwide CW threat decreases or increases in the coming decade depends in part on how effectively the CWC is implemented.⁵⁹

The Central Intelligence Agency has identified several dangerous chemical and biological weapons proliferation trends:⁶⁰

- Developments in biotechnology, including genetic engineering, may produce a wide variety of live agents and toxins that are difficult to detect and counter; and new CW agents and mixtures of CW and BW agents are being developed.
- Some countries are becoming self-sufficient in producing CW and BW agents and less dependent on imports.
- Countries are using the natural overlap between weapons and civilian applications of chemical and biological materials to conceal CW and BW production; controlling exports of dual-use technology is ever more difficult.
- Countries with CW and BW capabilities are acquiring sophisticated delivery systems including cruise and ballistic missiles.
- Scientists with experience in CW and BW production continue to leave countries of the former Soviet Union.
- About one dozen terrorist groups have sought CW, BW, and nuclear material or expressed interest in them; several countries with CW and BW capabilities have sponsored terrorists.

Missile Arsenals and Programs

Nearly all countries that reportedly have or are seeking nuclear, biological, or chemical weapons also have ballistic missiles—four do not (Cuba, Sudan, Myanmar, Thailand).⁶¹ About 15 other countries have ballistic missile programs but no known WMD capability.⁶² The five nuclear weapons-states have intercontinental ballistic missiles or submarine launched ballistic missiles. North Korea tested a Taepo-dong 1 with a third stage in 1998, demonstrating a potential ICBM capability.⁶³ However, the third stage failed to separate. Additionally, Pyongyang's July 2006 test

⁵⁸ CRS Report RL32158, *Chemical Weapons Convention: Issues for Congress*, by Steve Bowman.

⁵⁹ Jonathan Tucker suggested a variety of improvements to the inspection regime in "Verifying the Chemical Weapons Ban: Missing Elements," *Arms Control Today*, January/February 2007.

⁶⁰ John A. Lauder, Special Assistant for Nonproliferation to the Director of Central Intelligence, "Unclassified Statement to the Commission to Assess the Organization of the Federal Government to Combat the Proliferation of Weapons of Mass Destruction," as prepared for delivery on April 29, 1999, pp. 4-5.

⁶¹ The ballistic missiles referred to in this report are guided during a portion of their ascent, then follow a ballistic (unguided and unpowered) trajectory over the remainder of the flight. Cruise missiles are continually powered by an air-breathing or rocket engine and are generally guided for their entire flight. Excluded are all air-to-air, surface-to-air, antitank, anti-ship, and air-to-surface missiles, unguided artillery rockets, and satellite launch vehicles.

⁶² Countries with ballistic missiles but no known NBC weapons are: Afghanistan, Argentina, Armenia, Belarus, Bulgaria, Czech Republic, Greece, Netherlands, Romania, Slovakia, Turkey, Turkmenistan, Ukraine, United Arab Emirates, and Yemen. For further discussion see CRS Report RL30427, *Missile Survey: Ballistic and Cruise Missiles of Selected Foreign Countries*, by Andrew Feickert.

⁶³ The CIA estimated in 2001 that if North Korea can make the third stage function properly, and if it has a reentry vehicle to protect a warhead, it might be able to deliver a small payload to ICBM range. See CIA, Unclassified Summary, *National Intelligence Estimate of Foreign Missile Development and Ballistic Missile Threats through 2015*, December 2001, (hereafter *Unclassified NIE Ballistic Missile Threat*).

of a Taep'o-dong 2 in failed approximately 42 seconds after launch.⁶⁴ North Korea has about 500 Scuds and 100 Nodong missiles and has exported hundreds of missiles to the Middle East.⁶⁵ In the late 1980s, Saudi Arabia bought medium-range ballistic missiles (MRBM) from China. Israel, India, Pakistan, and Iran have MRBMs and may be working to develop intermediate range ballistic missiles and, perhaps eventually ICBMs with ranges over 5500 km.⁶⁶ At least 25 other countries have short-range ballistic missiles with ranges under 1000 km. Entities in North Korea, Russia, and China have exported missiles and missile technology to foreign programs. Organizations in Russia and China have supplied material, components, and technical assistance to Iran, India, Libya, Pakistan, Syria, and North Korea.⁶⁷

Cruise missiles are more widely distributed. About 81 countries possess them, and 18 countries can manufacture them. Most of these missiles are procured for anti-ship missions and have ranges below the Missile Technology Control Regime (MTCR) 300-km threshold. Russia, Ukraine and France have long-range, sophisticated cruise missiles capable of carrying nuclear weapons. The UK purchased Tomahawk cruise missiles and is jointly producing the Apache cruise missile with France. Germany, and possibly China, are developing cruise missiles at the MTCR limit, and the UK and Italy are developing missiles with shorter ranges.

Another dangerous trend is the spread of production technology, as North Korea, China, and various groups in Russia have helped other countries design, test, and produce their own missiles. With their help, Pakistan and Iran test fired medium-range ballistic missiles in April and July 1998 respectively. The Russian and Chinese governments have promised to restrict missile technology exports, but it is not clear they are committed to the effort. Even Iran, Libya, and Egypt have been identified as sources of missiles or some missile production technology.

In the case of cruise missiles, production technology is even more widespread. Of the 81 countries possessing such missiles, about 18 produce them, but 22 additional countries have emerging manufacturing capabilities.⁶⁸ Many production technologies, like sensors and flight controls, are becoming or are already available commercially. Satellite-assisted guidance technology (Global Positioning System) has improved accuracy. The widespread use of unmanned aerial vehicles in the war on terrorism in Afghanistan has been hailed by some as the coming of age of remotely piloted vehicle technology. While much of the technology associated with cruise missiles is controlled under MTCR guidelines, the sophistication of what is available commercially is growing by leaps and bounds.

⁶⁴ See analysis at <http://www.globalsecurity.org/wmd/library/news/dprk/2006/060710-nkir2627.htm>

⁶⁵ General Thomas Schwartz, U.S. Army, Commander of United Nations Command and ROK/U.S. Combined Forces Command, Testimony before the Senate Armed Services Committee, March 7, 2000.

⁶⁶ Israel produces the Jericho 1 short-range ballistic missile (SRBM) and Jericho 2 MRBM and is developing the Jericho 3 which various reports describe as an intermediate-range ballistic missile (IRBM) or an ICBM. Israel also produces space launch vehicles that could be converted to ballistic missiles, possibly ICBMs. India has developed and tested the Agni MRBM and space launch vehicles. Pakistan's Ghauri and Iran's Shahab 3 are both MRBMs based on North Korea's Nodong. Both those countries are developing longer range missiles. See CRS Report RL30427, *Missile Survey: Ballistic and Cruise Missiles of Selected Foreign Countries*, by Andrew Feickert.

⁶⁷ CIA, *Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Weapons, 1 July through 31 December 2001* (hereafter CIA, WMD/ACM Dec. 2001); and "Russia Sells Missile Technology to North Korea," *Washington Times*, June 30, 2000.

⁶⁸ Christopher Bolkcom, Statement before the Senate Governmental Affairs Committee, Subcommittee on International Security, Proliferation, and Federal Services, June 11, 2002, p. 18.

Table 1. The State of Proliferation

	Nuclear Weapons Capability	Biological Weapons Capability	Chemical Weapons Capability	Ballistic Missiles (Longest)	Cruise Missiles
Algeria	— ^a	Research?	Suspected	SRBM	Anti-ship
China	NWS	Likely ^b	Suspected ^b	ICBM	Produce Anti-ship
Cuba	—	—	—	—	Anti-ship
Egypt	Ended	Known R&D ^c	Likely	SRBM	Anti-ship
France	NWS	Ended	Ended	SLBM	Produce Variety
India	Stockpile ^d	—	Has Had ^e	MRBM	Produce Variety
Indonesia	—	—	Sought	—	Anti-ship
Iran	Seeking ^f	Likely	Has Had ^g	MRBM	Produce Anti-ship
Iraq	Ended	Ended ^h	Ended ^h	SRBM	Produce Variety?
Israel	Stockpile ⁱ	Likely R&D	Likely	MRBM	Produce Variety
Kazakhstan	Ended (Soviet)	—	Suspected ⁱ	SRBM	—
Libya	Ended	—	Ended ^k	MRBM	Anti-ship
Myanmar	—	—	Suspected	—	—
North Korea	Probable Stockpile ^l	Likely	Known	IRBM	Produce Anti-ship
Pakistan	Stockpile ^m	— ⁿ	Likely	MRBM	Anti-ship
Russia	NWS	Suspected ^o	Known	ICBM	Produce Variety
Saudi Arabia	— ^p	—	Suspected ^q	MRBM	Anti-ship
Serbia	—	—	Ended		
South Africa	Ended	Ended	Suspected	Ended	Produce Anti-ship
South Korea	Ended	—	Suspected	SRBM	Anti-ship
Sudan	—	—	Suspected ^r	—	—
Syria	—	Seeking	Known	SRBM	Anti-ship
Taiwan	Ended	— ^s	Likely	SRBM	Produce Variety
United Kingdom	NWS	Ended	Ended	SLBM	Variety
United States	NWS	Ended	Known	ICBM	Produce Variety
Vietnam	—	—	Likely	SRBM	Anti-ship

Notes: NWS = declared nuclear weapon state; SRBM = short-range ballistic missile <1000 km-range; MRBM = 1001-3000 km; IRBM = 3001-5500 km; ICBM = > 5500 km-range; SLBM = Submarine Launched Ballistic Missile.

- a. In the early 1990s, press accounts created suspicions that Algeria was pursuing a nuclear weapons program. However, the Department of State told Senator Joseph Biden in 1991 that “we have no evidence that Algeria seeks to develop a nuclear weapons capability.” Additionally, a 1991 National Security Council document stated that an “IAEA safeguarded reactor...would not pose a significant proliferation risk,” adding that an Algerian nuclear weapons program “would probably require significant foreign assistance.” For more information, see David Albright and Corey Hinderstein, “Algeria: Big Deal in the Desert?” *Bulletin of the Atomic Scientists*; May/Jun 2001; 57, 3; Research Library pg. 45. For an account of recently-released U.S. documents on the matter, see William Burr, Ed. “The Algerian Nuclear Problem, 1991: Controversy over

- the Es Salam Nuclear Reactor,” National Security Archive Electronic Briefing Book No. 228, September 10, 2007. <http://www.gwu.edu/~nsarchiv/nukevault/ebb228/index.htm>
- b. The State Department, in its 2005 report to Congress *Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments* (hereafter, *Compliance 2005*), noted that China previously had a biological weapon program and that it was highly probable that China remained noncompliant with obligations under the BW Convention. DoD stated that “...China may retain elements of its biological warfare program.” Department of Defense, *Proliferation: Threat and Response*, January 2001, p. 15 (hereafter *PTR 2001*). Regarding CW, *Compliance 2005* reported that China retained the capacity to mobilize production, though information is insufficient to determine if it has a current R&D program.
 - c. According to a 1998 Arms Control and Disarmament Agency compliance report, “The United States believes that Egypt had developed BW agents by 1972. There is no evidence to indicate that Egypt has eliminated this capability and it remains likely that the Egyptian capability to conduct BW continues to exist.” These concerns are not expressed in similar reports issued in 2001 and 2005.
 - d. India detonated a nuclear device in 1974 and claimed to detonate 5 nuclear devices in 1998 with varying yields. Estimates of its nuclear weapons stockpile vary widely, from 36 to 100.
 - e. When it became a state party to the Chemical Weapons Convention, India admitted that it had produced a chemical weapons stockpile, but has since hosted all required CWC inspections. It retains the capability to produce CW. *PRT 2001*, p. 25.
 - f. The most recent National Intelligence Estimate (NIE), released in December 2007, states that Iran had a nuclear weapons program in the past, but halted it in fall 2003. The NIE also states that the intelligence community assesses “with moderate confidence Tehran had not restarted its nuclear weapons program as of mid-2007,” but adds that Iran “at a minimum is keeping open the option to develop nuclear weapons.”
 - g. Iran used chemical weapons in 1987 during the Iran-Iraq War and also supplied Libya with chemical weapons which were later used in Chad. *PTR 1997*, pp. 15-16. “It is also believed to be conducting research on nerve agents.” *PTR 2001*, p. 36.
 - h. Iraq destroyed its CW and BW stockpiles during the 1990s. Iraq used CW against Iran and against its own Kurdish population in the 1980s.
 - i. Although press reports and the academic community generally report that Israel has between 75 and 200 nuclear weapons (including thermonuclear weapons), many of which could be deployed with its missile force, the Israeli government has not officially acknowledged the weapons’ existence.
 - j. Kazakhstan reportedly retained some Soviet-era CW stockpiles.
 - k. Libya used Iranian-supplied chemical weapons in Chad. Libya declared to the OPCW on March 5, 2004 that it had produced 23 tons of mustard gas at Rabat between 1980 and 1990 and stored those materials at 2 sites. Libya also declared thousands of unfilled munitions.
 - l. In total, it is estimated that North Korea has up to 50 kilograms of separated plutonium, enough for at least half a dozen nuclear weapons.
 - m. Pakistan detonated several nuclear devices in May 1998. Its stockpile is estimated to be approximately 60 nuclear weapons.
 - n. Pakistan is believed to have the resources and capabilities to support a limited biological warfare research and development effort,” *PTR 2001*, p. 28.
 - o. Russia acknowledged it had a clandestine BW program and claims to have stopped production. However, the U.S. is not assured that Russia is in compliance with the Biological Weapons Convention.
 - p. There are reports of Saudi interest in funding the Pakistani nuclear programs and reports of visits by Saudis to Pakistani nuclear facilities. See Shahram Chubin, “Eliminating Weapons of Mass Destruction: The Persian Gulf Case,” The Henry L. Stimson Center, March 1997, p. 20; “Saudi Arabia: Weapons of Mass Destruction Capabilities and Programs,” Center for Nonproliferation Studies, Monterey Institute of International Studies; *New York Times*, July 10, 1999; Reuters, August 3, 1999; *New York Times*, August 7, 1994.
 - q. There are unconfirmed reports that Saudi Arabia may have developed chemical warheads for its CSS-2 missiles. NBC Capabilities, Saudi Arabia, *Jane’s NBC Defense Systems 1998-1999*. Also, *Defense and Foreign Affairs Weekly*, April 1991, reported Chinese assistance to Saudi Arabia in developing chemical warheads. Also, in the *Arms Control Reporter* as of March 13, 1991 and May 1992, 704.E-0.10.
 - r. Sudan “may be interested in a biological weapons program as well.” “Sudan, a party to the CWC, has been developing the capability to produce chemical weapons for many years. It historically has obtained help from foreign entities, principally in Iraq.” Director of Central Intelligence, *WMD/ACM Dec 2001*.
 - s. A 1998 Arms Control and Disarmament Agency compliance report states that the United States “believes that Taiwan has been upgrading its biotechnology capabilities,” but adds that “[t]he evidence indicating a

BW program is not sufficient to determine if Taiwan is engaged in activities prohibited by the BWC.” This concern is not mentioned in similar reports issued in 2001 and 2005.

Trends Regarding NBC Weapons and Missiles

Despite increasingly available technology, states are not driven inexorably toward acquiring NBC weapons and missiles, as is apparent in **Table 1**. Political and economic trends can yield incentives or disincentives for states (and, perhaps, terrorist organizations) to develop, maintain, or abandon NBC weapon or missile capabilities. Some developments in the last ten to fifteen years that have helped shape the international environment for nonproliferation are listed below. **Table 2** (page 22) shows membership in international control regimes.

The risk of a massive exchange of nuclear weapons, and of massive biological or chemical attacks, has decreased in the last decade. The reduction of nuclear weapons under START and the Moscow Treaty, continuing unilateral reductions, and improved safeguarding of nuclear weapons and materials continue to decrease the risk of nuclear war in Europe and North America, an accidental launch, and the proliferation of nuclear weapons.

More recently, the United States has established several vehicles to improve cooperation with allies on controlling the transfer of sensitive technologies, particularly to combat terrorist acquisition of NBC weapons and related materials. These include the G-8 Global Partnership, the Proliferation Security Initiative, and passage of U.N. Security Resolution 1540.

However, nuclear weapons threats obviously persist. Russia has thousands of nuclear weapons, a military doctrine that calls for the use of nuclear weapons to prevent defeat on the battlefield, and large stockpiles of nuclear, chemical, and biological weapons material. Several Russian organizations have provided WMD technology to Iran, North Korea, and other potentially hostile countries. Russian scientists reportedly have aided other states’ WMD programs.⁶⁹

Additionally, there is the possibility that, in the near future, there will be no U.S.-Russian strategic nuclear arms control agreements. The START Treaty expires in December 2009. Russia and the United States could extend the treaty for another five years. The two governments have held some preliminary discussions about START’s future, but have not reached agreement. The Moscow Treaty, which entered into force in 2003, has no verification regime and expires at the end of 2012.

China has joined the NPT and NSG, ratified the CWC, stopped nuclear tests, halted fissile material production, and signed the CTBT. It also agreed not to export complete missiles controlled by the MTCR guidelines (Category I). But China is modernizing its nuclear missile force (though its size is not expected to approach that of the United States or Russia); maintains CW and possibly BW stocks and provides missile technology to Iran, Pakistan, North Korea, and Syria; and has adopted a threatening posture toward Taiwan.⁷⁰

States adopted export controls and joined and strengthened multilateral control regimes in the 1990s in the areas of nuclear weapons, missile technology, and chemical weapons. Some developments were:

- Indefinite extension of the NPT in 1995 and 1998 Additional Protocol for strengthened nuclear safeguards.

⁶⁹ Tenet, “Post-9/11 Threat,” p. 13.

⁷⁰ See *PTR 2001*, p. 14.

- Comprehensive Test Ban Treaty was signed by many countries and may reduce the likelihood that some additional countries will develop, test, and deploy nuclear weapons.
- MTCR created (1987), since strengthened and expanded to control missile technology.
- Chemical Weapons Convention entered into force (1997), decreasing the likelihood of large-scale CW production and use.

Nevertheless, the future of multilateral arms control appears dim, with no plans for the United States to approve ratification of the CTBT, no plans to create a workable verification protocol under the BWC and little movement forward in crafting a treaty to end fissile material production for use in nuclear weapons.

NBC Suppliers

Former Director of National Intelligence, John Negroponte, told Congress in February 2006 that

Technologies, often dual-use, move freely in our globalized economy, as do the scientific personnel who design them. So it is more difficult for us to track efforts to acquire those components and production technologies that are so widely available...We also are focused on the potential acquisition of such nuclear, chemical, and/or biological weapons—or the production technologies and materials necessary to produce them—by states that do not now have such programs, terrorist organizations like al-Qa’ida and by criminal organizations, alone or via middlemen.⁷¹

Elements in countries such as North Korea, China, and Russia continue to be primary suppliers of NBC weapons-related technology. But U.S. intelligence officials have expressed concern in recent years about a second tier of suppliers. Then-DCI Tenet testified in 2002 that

it’s important to focus on the totality of what’s going on, it’s the combination of the Russian assistance, the Chinese assistance, the North Korean assistance that allows people to mix and match, create an indigenous capability that then threatens us that becomes available for secondary proliferation.⁷²

Tenet further warned in 2003 that “[w]ith the assistance of proliferators, a potentially wider range of countries may be able to develop nuclear weapons by “leapfrogging” the incremental pace of weapons programs in other countries.”⁷³ He also noted that BW and CW programs in “countries of concern are becoming less reliant on foreign suppliers—which complicates our ability to monitor programs via their acquisition activities.”

As Negroponte suggested, non-state actors could well continue to play an important role in proliferation. Tenet was more emphatic in 2003, asserting that

we have entered a *new world of proliferation*. In the vanguard of this new world are knowledgeable non-state purveyors of WMD materials and technology. Such non-state

⁷¹ Statement by the Director of National Intelligence, John D. Negroponte to the Senate Armed Services Committee, “Annual Threat Assessment of the Director of National Intelligence for the Senate Armed Services Committee,” February 28, 2006.

⁷² DCI Tenet statement during question and answer session of Senate Armed Services Committee hearing on the Worldwide Threat, March 19, 2002.

⁷³ Tenet, “The Worldwide Threat in 2003: Evolving Dangers in a Complex World,” DCI’s Worldwide Threat Briefing February 11, 2003.

outlets are increasingly capable of providing technology and equipment that previously could only be supplied by countries with established capabilities. [Emphasis in original.]

The Khan network has probably been damaged considerably, but some elements of it may still exist.⁷⁴ Additionally, other similar networks could take its place.

Table 2. International Commitments

	NPT	CWC	BWC	CTBT	NSG	MTCR	IAEA safeguards
Algeria	R	R	R	R	—	—	All
China^b	R	R	R	S	P	Pledged	Some ^a
Cuba	R	R	R	—	—	—	All
Egypt	R	—	S	S	—	—	All
Ethiopia	R	R	R	R	—	—	All
France	R	R	R	R	P	P	Some ^a
India	—	R	R	—	Pledged	Pledged	Some
Indonesia	R	R	R	S	—	—	All
Iran	R	R	R	S	—	—	All
Iraq	R	—	R	—	—	—	All
Israel	—	S	—	S	—	Adherent	Some
Kazakhstan	R	R	—	R	—	—	All
Libya	R	R	R	R	—	—	All
Myanmar (Burma)	R	S	S	S	—	—	All
North Korea^c	—withdrew	—	R	—	—	—	—
Pakistan	—	R	R	—	—	—	Some
Russia	R	R	R	R	P	P	Some ^a
Saudi Arabia	R	R	R	—	—	—	—
South Africa	R	R	R	R	P	P	All
South Korea	R	R	R	R	P	P	All
Sudan	R	R	R	R	—	—	All
Syria	R	—	S	—	—	—	All
Thailand	R	R	R	S	—	—	All
United Kingdom	R	R	R	R	P	P	Some ^a
United States	R	R	R	S	P	P	Some ^a
Vietnam	R	R	R	R	—	—	All
Yugoslavia (Serbia & Montenegro)	R	R	R	R	—	—	All

Sources: International Atomic Energy Agency <http://www.iaea.org/Publications/Documents/Treaties/npt.html>; <http://www.opbw.org> <http://www.opcw.org> <http://www.ctbto.org>.

⁷⁴ CRS Report RL34248, *Pakistan's Nuclear Weapons: Proliferation and Security Issues*, by Paul K. Kerr and Mary Beth Nikitin.

Notes: NPT = Nuclear Non-Proliferation Treaty; CWC = Chemical Weapons Convention; BWC = Biological Weapons Convention; CTBT = Comprehensive Test Ban Treaty; NSG = Nuclear Suppliers Group; MTCR = Missile Technology Control Regime; IAEA safeguards = Inspections of facilities under an agreement with the International Atomic Energy Agency. P = Participant; R = Ratified or acceded; S = Signed but not yet ratified; Pledged = Unilaterally agreed not to export missiles that meet MTCR thresholds; Adherent = Entered an international agreement with the United States to abide by MTCR.

- a. The 5 nuclear weapon states have voluntary inspections at some, but not all facilities.
- b. The IAEA applies safeguards to the nuclear facilities in Taiwan, but recognizes the PRC as the only government to represent China.
- c. North Korea announced its withdrawal from the NPT January 10, 2003. Whether the government remains an NPT state-party is unclear.

Appendix. Risks of Nuclear Conflict

The risk of nuclear weapons use can be roughly estimated using such factors as:

- the existence of nuclear weapons and delivery systems in various countries
- information on the readiness of those weapons for use (weaponization, deployment, alert status)
- evidence indicating that the conditions for using nuclear weapons in a country's strategy and doctrine were close to being met
- the level of conflict between a nuclear-armed state and its adversary(ies)
- the level of frustration with a long confrontation that was inflicting heavy casualties, draining national resources and patience, and challenging the leader's credibility, even if not threatening national integrity.

It is possible that as more countries acquire nuclear weapons or expand their nuclear arsenals, the likelihood they will use nuclear weapons will increase. The acquisition of nuclear weapons by countries with inadequate command and control systems, vague strategic doctrine (or aggressive operational doctrine), and poor intelligence on enemy capabilities and intentions could particularly increase the risk of nuclear warfare.

Table A-1 highlights some key events since the development of nuclear weapons that analysts use to assess the risk of nuclear warfare. Many national security analysts agree that the risk of nuclear warfare rose in the early 1950s and probably peaked during the Cuban Missile Crisis. Tensions remained relatively high through the 1960s, leading to a high risk of Sino-Soviet confrontation in 1969. The early 1980s saw renewed risk of US-USSR nuclear warfare, but that risk declined precipitously with Gorbachev's opening of the USSR. With the addition of new, de facto nuclear weapon states, new risks have emerged in the Middle East, South Asia, and on the Korean Peninsula. The clash in Kargil and ongoing Indian and Pakistani tensions probably present the greatest risk of nuclear war since the end of the Cold War.

Several European and Canadian defense experts expressed the view in 2000 that the threat of nuclear war has diminished substantially over the past decade and their feeling of safety has increased.⁷⁵ Views that the threat has diminished may reflect the probability that a future nuclear war is more likely to occur in Asia or the Middle East.

Although the nuclear arsenals of China, India, and Pakistan are now considered primarily to be deterrent forces, some analysts are concerned these countries may be adopting doctrine calling for the tactical use of nuclear weapons under dire circumstances in regional conflicts. Others worry that the very existence of nuclear weapons in the arsenals of antagonist countries raises the probability of nuclear war through miscalculation or desperation, if not in response to national doctrine. Other analysts contend the possession of nuclear weapons by one country in a conflict is likely to deter other countries from using their own nuclear weapons or, generally, attempting to

⁷⁵ *The Ottawa Citizen*, August 25, 2000, cited in the *Ballistic Missile Defense Organization External Affairs Digest*, August 31, 2000; Carnegie Endowment for International Peace, "Why U.S. Allies Do Not See a Missile Threat," September 21, 2000.

conquer the nuclear-armed country.⁷⁶ The tense situation along the Line of Control in Kashmir has generated significant media coverage about what might trigger a nuclear war in South Asia.⁷⁷

In addition, the fact that a future nuclear attack may consist of a small number of detonations rather than a catastrophic exchange of hundreds or thousands of nuclear warheads may lead some to feel the threat is reduced. Other observers regard any developments that make nuclear weapons more usable (i.e., smaller yields, less radiation fallout, or tailored for specific missions) as potentially destabilizing. This perspective underlined much of the recent criticism of leaks surrounding the new U.S. Nuclear Posture Review. A resumption of nuclear testing would probably also be viewed by observers in that camp as destabilizing.

⁷⁶ For further discussion of deterrence, see CRS Report RL30623, *Nuclear Weapons and Ballistic Missile Proliferation in India and Pakistan: Issues for Congress*, by K. Alan Kronstadt; and "Israel's Nuclear History," *Jane's Intelligence Review*, July 2000, p. 14. See also Rodney Jones, "Minimum Nuclear Deterrence Postures in South Asia: An Overview," Final Report, October 1, 2001, prepared for the Defense Threat Reduction Agency.

⁷⁷ See CRS Report RS21237, *Indian and Pakistani Nuclear Weapons*, by Sharon Squassoni.

Table A-1. Key Nuclear-Relevant Events

	Strategic Conflict	Strategic Cooperation	Regional conflict	Regional Cooperation
1940s	45: Hiroshima, Nagasaki 48: East Europe under USSR 49: USSR atomic test			
1950s	50-53: Korean War 53: Russian H bomb test; US tactical nukes to Europe 56: Hungary uprising		54/5: Formosa Crisis 56: Mideast war	
1960s	61: Berlin 62: Cuban Missile Crisis 63: Berlin 68: Prague spring	63: Hotline	62: Indo-China border war 64: China Nuclear test 65: Indo-Pakistani conflict 68: Tet offensive 69: Sino-Soviet border clash	63: Limited Test Ban Treaty 67: Treaty of Tlatelolco signed (banning nuclear weapons in Latin America) 68: NPT signed
1970s	77: SS-20s deployed 79: USSR invades Afghanistan	71: Risk Reduction Measures ^a 72: ABM Treaty 73: Prevention of Nuclear War 74: Nuclear Suppliers' Group	73: Mideast War 74: Indian Atomic Test	72: Hotline between military commanders of India & Pakistan
1980s	81: Martial law in Poland 83: Pershing-2s deployed KAL007 shot down	85/6: Gorbachev 87: INF Treaty 88: Ballistic missile launch notification 89: Berlin wall falls	80-8: Iran-Iraq War 87: Operation Brass Tacks (India, Pakistan)	89: Hotline established between prime ministers of India & Pakistan
1990s		90: Germany reunified 91: Nunn-Lugar program begun 93: START II signed	91: Gulf War 92: N. Korea crisis begins 98: India, Pak test nuclear devices 98: NK, Pak, India, Iran test missiles 99: Kargil	91: India & Pakistan agree to not attack each other's nuclear facilities; regular use of a hotline; pre-notification of troop movements. 94: Agreed Framework w/ N. Korea 99: Lahore Agreement (India-Pakistan)
2000s		02: Strategic arms reduction agreement between U.S. & Russia	01: Kashmir 02: Kashmir; India and Pakistan test missiles 03: Invasion of Iraq 06: N. Korean nuclear test	00: Talks between North and South Korea 02: India affirms no-first-use of nuclear weapons 05: Six Party Talks

a. Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War Between U.S. and USSR.

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